NOTES ON THE GREEN KEELBACK SNAKE (*MACROPISTHODON PLUMBICOLOR*)

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INTRODUCTION

These notes were compiled from the observation of three different specimens, of which the first two came to me when young (8″ to 10″ in length and probably less than six months old). Snake A was taken on 28-9-69 and given away about one month later. Snake B was taken on 22-6-70; it escaped on 14-5-71 and was not recaptured. Snake C is still with me.[2] Taken on 29-5-71, it was at first thought to be identical with Snake B; however, certain differences of behaviour, and what seemed to be a lesser degree of intelligence, soon led me to conclude that it was a different individual.

Accommodation: While small, each snake was kept in a square glass jar 10″ high with a base of 5¼″ by 5¼″. The floor was covered with newspaper, and extra pieces of paper were kept for the snake to hide beneath. All pieces were changed as soon as found soiled. A small bowl of water was added. Snakes B and C, after some growth were kept in an observation cage 20″ by 12″ and 8½″ high, having a front of glass and a roof of fine wire mesh. Sheets of paper covered the floor, with some extra pieces scattered about. In one corner stood a bowl of water; in another rested an inverted piece of flower-pot, under which the snake slept or rested, tightly curled. The above "furniture" has been found entirely adequate for the comfort of this quiet and non-demanding reptile.

Description: So far as could be checked, the description given by Dr. P. J. Deoras in his SNAKES OF INDIA (pp. 112-113) was confirmed subject to the following details:—

(1) The thin lateral lines were whitish rather than yellow; with growth they disappeared.
(2) While the snakes were small, the ventral surface, with the exception of the white chin and throat, was definitely smoky black in colour; the surface turned ivory white only after several months of growth.
(3) The colour between the head chevron and nape chevron was lemon yellow, not orange. This colour fades with growth, and the chevrons become paler; at full growth the yellow has disappeared and scarcely a trace of the chevrons is left.
(4) The "black short cross-stripes across the body" were not observed.
(5) A few white spots (not mentioned by Deoras) are spaced at intervals along the back and flanks. These are ordinarily inconspicuous, but show up very distinctly when the body is distended after a meal. With growth the spots become pale blue rather than white.
(6) Snake C showed a small black spot on either side of the neck; the two did not lie exactly opposite to each other.

The grass-green colour is bright and shining (more in young than in old snakes) immediately after sloughing. The choice of

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"plumbicolor" for the specific name is strange, being merited only for the last few days before sloughing, when the skin looks dull and grey.

Exact measurements were not easy to take, and were unfortunately neglected. Snake B was estimated by mid-December 1970 to have doubled its length of six months earlier; it had become markedly thicker and stronger during the six months of captivity. Its skins sloughed on 17-9-70, 6-10-70 and 29-10-70 were measured at 13″, 14″ and 15″ respectively. Such measurements no doubt have only a relative value, since a skin is liable to become stretched in length. Snake C's skin cast on 8-7-71 was measured at 22½″. Full growth was probably attained early in 1972, at an estimated age of two years. In September 1974 Snake C was measured at 24½″, its most recently cast skin measuring 26½ inches.

Snake B's body, after a heavy meal following a 26 days' fast (due to a temporary escape) was greatly distended; the green scales stood out like islands surrounded by blue-black, and the white spots were very prominent. For two days, sharp protuberances (presumably the frog's bones) could be distinctly seen along its flank.

The teeth consist of two short, sharp-pointed, triangular teeth in the upper jaw, placed one on either side, and of many small rudimentary teeth in the lower jaw. The latter serve only to grip the slippery prey; it is the two formidable upper-jaw teeth which inflict the wounds and draw the prey into the gullet.

General behaviour: Snakes A and B, and Snake C subject to the exception of rare occasions, were utterly gentle at all times and could be freely handled. While being handled, and at most other times also, the snakes moved sluggishly; only when hungry and in the immediate presence of prey did they execute swift and vigorous movements.

After completing a meal, the snakes would move about restlessly for some time and then retire to a place of concealment; here they would lie dormant until the need to defecate, to slough, or to feed again made them restless.

Snake C soon showed a tendency to anchor itself strongly by the tail; later, it developed the habit, when handled, of firmly gripping hand or finger with a half-coil. This snake showed much restlessness in August and September 71, but became very lethargic in the following January, probably due to the cold. Snake B had shown similar periods of torpidity in December (70) and February (71).

Snake C tended to become highly excited as soon as it was dropped into the feeding-jar, as though it knew that dinner was at hand. At such a time it would sometimes snap at a finger through the glass, open its mouth in a huge yawn of almost 180 degrees, and even try to bite the glass wall of the jar. This snake bit me on three occasions, and since such an experience has probably been shared by few people, it may be worth describing.

On the first occasion, which was the third day since the snake had come to me, I had just before handled frogs, and the smell may have acted as a provocation (although my observations tend to exclude the use of smell in detecting food). I began to pick the snake up in an altogether careless manner, and it immediately seized my right index finger and gripped with a power that surprised me. The two upper-jaw fangs pricked painfully and blood began to flow. The snake hung on like a bulldog, working his upper jaw on alternate sides (see the method described below). Quite apart from the pain, it was a strange sensation. I lifted the snake high in the air, but it hung on and continued to chew my finger. Then I had the idea of plunging both finger and

snake into a bucket of water. Even thus submerged, the snake hung on for nearly one minute before I felt its grip slackening and it reluctantly allowed me to draw my finger away from its fangs. Blood was flowing freely, and my finger was smeared with a sort of saliva. There were several wounds on the upper surface of my finger, but none on the lower surface, where I had merely felt the woundless grip of the lower-jaw teeth.

I placed the snake inside the feeding-jar and gave it a frog, which it seized and swallowed at once. Despite having eaten four frogs in the preceding three days, it must have been still hungry. Next day, the snake allowed me to handle it without any hostile reaction, and it was many months before it bit me again.

On the second and third occasions, the snake was certainly very hungry and should have been handled with a caution that I had lost from over-familiarity. I tried the bucket-of-water treatment on the second occasion, but it took even longer than the first time. On the third occasion, being unwilling to endure the painful pricking longer than necessary, I cut the matter short by forcing the reptile's jaws apart by firm yet careful lateral pressure.

Skin sloughing: This took place almost always at night and therefore could not be observed. I did however see something of the process in the case of Snake A. On 15-10-69 it moved about restlessly all day, sometimes dipping into the water bowl. Peristaltic movements were observed, and after the skin had split at the head there were strong contractions and expansions of the mid-body.

The intervals at which Snake B sloughed ranged from 17 to 23 days during the monsoon, with an average of 20 days. They ranged from 32 to perhaps 38 days (the snake was at liberty from 15-11-70 to 7-12-70, during which time it must have cast at least one skin, though probably only one) during the winter, with an average of 37 days; and from 13 to 19 days ,with an average of 16 days, during the summer.

Snake C, before full growth, sloughed at intervals ranging from 23 to 26 days (average, 25) during the monsoon; and from 37 to 42 days (average, $39\frac{1}{2}$) during the winter until observations were temporarily suspended. When observations were resumed, by which time the snake was fully grown, the recorded intervals were 21 days in the monsoon, 30 days between monsoon and winter, 41 to 47 days (average, 44) during the winter, 33 days between winter and summer, and from 20 to 25 days (average, $22\frac{1}{2}$) during the summer and ensuing monsoon. These figures take no account of a wholly abnormal interval of 37 days between 3-7-74 and 9-8-74, for which I can give no explanation except the wild guess that the snake might have eaten a skin before I found it. The intervals of sloughing plainly follow a fairly regular curve from season to season, reaching a peak in about January.
In almost each case, the skin was whole and undamaged. I have been able to give many away to interested students and others.

Food and feeding: According to my observations the diet consists exclusively of live amphibians. No "small birds" (see Deoras) were offered, but worms and grubs were offered and refused even by a long-fasting snake. Dead frogs aroused no interest, and Snake B even abandoned a frog which it had itself killed by over-vigorous subduing. However, frogs which "shammed" death (as frogs sometimes do when exhausted and finally unsuccessful in all efforts to escape) were carefully examined and then seized.

The prey was seized, by a swift dart, at any

available part of its body or limbs. When this happened to be the head, swallowing was easy and rapid, taking sometimes only a few seconds (6 seconds in the case of one small frog). If the first grip was on leg or waist, the snake would often, without allowing its victim to escape, gradually work round to the head. Sometimes a whole leg would be swallowed, followed by the trunk and the other limbs; sometimes a portion already swallowed would be disgorged in order to take a more convenient grip. An initially "awkward" grip, unless changed into a head grip, would entail a lengthy struggle to swallow lasting from 10 to 35 minutes. Where the frog was small relatively to the growth achieved by the snake, it could be confidently swallowed from the rear, all four legs being bunched up and disappearing last of all. A particularly strong and active frog might have to be subdued by vigorous chewing, in the course of which blood might flow and intestines leak forth. After being subdued, the frog would often be momentarily released and again seized by the head.

On 4-12-73 at 1945 hrs, Snake C was given a really large frog, larger than any attempted so far, and remarkable for abnormally well-developed thighs. The snake was very hungry and attacked the frog savagely at once. Four times it seized the frog, by hind leg, front leg, or waist; four times the frog escaped through its strength and vigorous kicking. A waist grip punctured the frog's body, allowing some blood and intestine to escape. Part of the snake's body became smeared with blood, and at one moment it began to seize its own blood-covered back. Its excitement reached such a pitch that once, when the frog tore itself free, the snake attacked the glass wall of the jar. Gradually the frog weakened, and the fifth grip, which was on the side of its head, seemed to suffocate it. When the fight had lasted some forty-five minutes, the frog, though still alive, appeared to give up. The snake now seized it deliberately by the head and began to swallow, which he found difficult owing to the victim's size, and his jaws were distended to an incredible extent.

Forty-five minutes later, the frog had been swallowed as far as his fat thighs, which, sticking out at right angles to the trunk, presented the snake with an insuperable difficulty. Twice the snake almost completely ejected the swallowed portion and tried afresh, but as I watched, I realised that it would never be able to complete the task unless one of the frog's thighs were removed. While I was cutting off one thigh, the snake retained the frog's head in its mouth, and when I had finished, it devoured the rest of the frog with little difficulty. The last toes disappeared at 2200 hours, just $2\frac{1}{4}$ hours from the time when the frog had been introduced into the jar. The snake's body was vastly swollen for most of its length, and twelve days elapsed before it was ready to feed again.

The method of drawing prey into the gullet is as follows:— One half of the amazingly flexible upper jaw, together with its pointed tooth, is raised clear of the frog's flesh, while the other half of the jaw keeps its tooth firmly embedded. The raised half is now advanced by a few millimetres and its tooth driven into the flesh. Now the hitherto "anchoring" half jaw is similarly raised, advanced, and driven into the frog slightly ahead of the tooth which is now "anchoring." Thus, by advancing either side alternately, the victim is gradually drawn into the snake.

The disappearance of the last limb is invariably followed by a prodigious yawn. The victim's body rapidly slips down the snake's body till it reaches the stomach. On one single occa-

sion, a frog was ejected (by Snake B) in a semi-digested state on the day after it had been swallowed.

Once hunger had been satisfied, the snakes would ignore any additional frogs offered. A full meal would be followed by a fast, the length of which depended upon the quantity of food consumed, as well as upon the proximity of sloughing. Usually the snakes lost all appetite for up to a week before sloughing, and during such an interval Snake A even licked a frog's back without attempting to seize it; there were however instances in which food was taken on the very day previous to sloughing. Casting of a skin normally left the snake very hungry. Snake B once fasted for 25 days (11 before and 14 after a sloughing) even though food was offered; but this was a unique occurrence.

In the absence of any device for weighing the frogs, quantities of food were difficult to estimate. The best I have been able to do is to make an arbitrary allowance of 1 point for a "small" frog, 1½ for a "medium small", 2 for a "medium", 3 for a "medium large", and 4 for a "large". On this scale, Snake B consumed the following quantities of food in the shape of frogs:—

July (70)	6	
Aug.	5	
Sept.	7	
Oct.	9	
Nov.	5	(at liberty from
Dec.	14	15 Nov. to 7 Dec.)

It must be conceded that the division by months is yet another arbitrary feature.

On a similar reckoning, Snake C has consumed the following amounts for the periods during which observations have been recorded:—

Period A

June (71)	19	Oct.	16½
July	12	Nov.	7
Aug.	9½	Dec.	11
Sept.	12		

Period B (following a gap of 19 months)

Aug. (73)	10 (for half the month)	Mar.	13
Sept.	10	Apr.	12½
Oct.	10	May	16½
Nov.	16	June	11½
Dec.	8½	July	15½
Jan. (74)	11	Aug.	19
Feb.	7		

The average for both periods is the same: 12½.

The snakes — especially Snake C — could scarcely ever locate the frog in the feeding-jar until it jumped. In order that the method of capturing and swallowing might be observed, the snakes were fed, up to May 1974, inside a large glass jar, usually at night-time. It took me longer than it should have done to realise that the snakes may well have been partially dazzled by the electric light. After I began to feed Snake C in his living-cage, in darkness or at most a dim light, this snake was able to locate its prey more easily and quickly, and to perceive it at a distance of several inches. Scent appears to play no part in the locating; in the feeding-jar Snake C was often observed to "crouch", with his head above and almost resting on the frog, helplessly waiting for some movement to betray his prey's whereabouts.

Jan. (71)	9	
Feb.	4	
Mar.	12	
Apr.	5	(followed by a 25 days' fast from 16 Apr.)

Defecation was found to begin about 30 hours after the meal. The first defecation would be followed by one or two others extending up to the fourth or fifth day after eating. The faeces, consisting partly of a brittle white powder and partly of a viscous black paste, have a strong and objectionable odour.

Conclusion: I would definitely recommend the keeping of this species of reptile to all zoologists and others who have the capacity to be interested in animal life. *M. plumbicolor* is non-poisonous, attractive, readily handled, gentle when young at all times, and gentle when older at all times except when roused by considerable hunger. If handling is viewed with misgiving, it may be omitted altogether, although such an omission will naturally detract from the value of the experience to be obtained. After being provided with the simple accommodation and "furniture" described above, the snake requires no attention beyond the supply of live frogs from time to time, and the replacement of soiled paper.

Apart from the interest and pleasure which the snakes have given to me personally, I have found them a most useful aid in trying to make my fellow citizens aware of the folly (even "crime" is perhaps not too strong) of wantonly slaughtering at sight all snakes wherever met, the many innocent, beautiful and beneficial no less than the few dangerous or deadly.